

WHAT IS CLAIMED IS:

1. A digital signal recording disc comprising:  
a first area storing a first-channel digital audio signal and a  
5 second-channel digital audio signal, the first-channel digital audio  
signal resulting from quantizing a first-channel analog audio signal  
with a first quantization bit number, the second-channel digital  
audio signal resulting from quantizing a second-channel analog audio  
signal with a second quantization bit number; and  
10 a second area differing from the first area and storing  
information of the first and second quantization bit numbers.
2. A digital signal recording disc as recited in claim 1, wherein  
the first-channel digital audio signal comprises a front-channel  
15 digital audio signal and the second channel digital audio signal  
comprises a rear-channel digital audio signal, and the first and  
second quantization bit numbers are different from each other.
3. A digital signal recording disc comprising:  
20 a first area storing a first-channel digital audio signal and a  
second-channel digital audio signal, the first-channel digital audio  
signal resulting from an analog-to-digital conversion of a first-  
channel analog audio signal at a first sampling frequency, the  
second-channel digital audio signal resulting from an analog-to-  
25 digital conversion of a second-channel analog audio signal at a  
second sampling frequency; and

a second area differing from the first area and storing information of the first and second sampling frequencies.

4. A digital signal recording disc as recited in claim 3, wherein  
5 the first-channel digital audio signal comprises a front-channel digital audio signal and the second-channel digital audio signal comprises a rear-channel digital audio signal, and the first and second sampling frequencies are different from each other.

10 5. A digital signal recording disc as recited in claim 3, wherein the first-channel digital audio signal comprises a front-channel digital audio signal and the second-channel digital audio signal comprises a rear-channel digital audio signal, and the first and second sampling frequencies are equal to each other, and wherein  
15 the rear-channel digital audio signal results from thinning, and the second area stores information of the thinning.

6. A digital signal recording disc as recited in claim 3, wherein the first-channel digital audio signal comprises a front-channel  
20 digital audio signal and the second-channel digital audio signal comprises a low-frequency-effect-channel digital audio signal, and the first and second sampling frequencies are equal to each other, and wherein the low-frequency-effect-channel digital audio signal results from thinning, and the second area stores information of the  
25 thinning.

7. A digital signal recording disc comprising:

a first area storing a first-channel digital audio signal and a second-channel digital audio signal, the first-channel digital audio signal resulting from an analog-to-digital conversion of a first-

5 channel analog audio signal at a first sampling frequency and a first quantization bit number, the second-channel digital audio signal resulting from an analog-to-digital conversion of a second-channel analog audio signal at a second sampling frequency and a second quantization bit number, the second sampling frequency differing  
10 from the first sampling frequency, the second quantization bit number differing from the first quantization bit number; and

a second area differing from the first area and storing information of the first and second sampling frequencies and also information of the first and second quantization bit numbers.

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8. A digital signal recording disc comprising:

a first area storing at least first-channel and second-channel digital audio signals each assigned to either a first channel group or a second channel group, the digital audio signal in the first channel  
20 group resulting from an analog-to-digital conversion of a first analog audio signal at a first sampling frequency and a first quantization bit number, the digital audio signal in the second channel group resulting from an analog-to-digital conversion of a second analog audio signal at a second sampling frequency and a second

25 quantization bit number; and

a second area differing from the first area and storing

information of the first and second sampling frequencies and  
information of the first and second quantization bit numbers, and  
also information of the assignment of the first-channel and second-  
channel digital audio signals to the first and second channel groups.

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9. A digital signal recording disc as recited in claim 7, wherein  
the first area stores left-channel and right-channel stereophonic  
digital audio signals, the left-channel and right-channel  
stereophonic digital audio signals resulting from an analog-to-digital  
10 conversion of left-channel and right-channel stereophonic analog  
audio signals at a third sampling frequency, and wherein the second  
area stores information of the third sampling frequency.

10. A digital signal recording disc as recited in claim 7, wherein  
15 the first area stores left-channel and right-channel stereophonic  
digital audio signals, the left-channel and right-channel  
stereophonic digital audio signals resulting from an analog-to-digital  
conversion of left-channel and right-channel stereophonic analog  
audio signals at a third quantization bit number, and wherein the  
20 second area stores information of the third quantization bit number.

11. A digital signal recording disc as recited in claim 9, wherein  
the left-channel and right-channel stereophonic digital audio signals  
differ from the first-channel and second-channel digital audio  
25 signals, and the first area comprises a first sub area storing the first-  
channel and the second-channel digital audio signals and a second

sub area storing the left-channel and right-channel stereophonic digital audio signals.

12. A digital signal recording disc as recited in claim 7, wherein  
5 the first-channel and second-channel digital audio signals result from an encoding process selected from among an AC-3 encoding process, an MPEG-1 encoding process, and an MPEG-2 encoding process.

10 13. An audio-signal encoding apparatus comprising:

first means for quantizing a front-channel analog audio signal into a corresponding front-channel digital audio signal at a first quantization bit number;

second means for quantizing a rear-channel analog audio  
15 signal into a corresponding rear-channel digital audio signal at a second quantization bit number differing from the first quantization bit number; and

third means for formatting the front-channel digital audio signal, the rear-channel digital audio signal, and information of the  
20 first and second quantization bit numbers into a structure having first and second areas, the first area containing the front-channel digital audio signal and the rear-channel digital audio signal, the second area differing from the first area and containing the information of the first and second quantization bit numbers.

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14. An audio-signal encoding apparatus comprising:

first means for quantizing a front-channel analog audio signal into a corresponding front-channel digital audio signal at a first sampling frequency;

5 second means for quantizing a rear-channel analog audio signal into a corresponding rear-channel digital audio signal at a second sampling frequency differing from the first sampling frequency; and

10 third means for formatting the front-channel digital audio signal, the rear-channel digital audio signal, and information of the first and second sampling frequencies into a structure having first and second areas, the first area containing the front-channel digital audio signal and the rear-channel digital audio signal, the second area differing from the first area and containing the information of the first and second sampling frequencies.

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15. An audio-signal encoding apparatus comprising:

first means for quantizing a front-channel analog audio signal into a corresponding front-channel digital audio signal at a first quantization bit number and a first sampling frequency;

20 second means for quantizing a rear-channel analog audio signal into a corresponding rear-channel digital audio signal at a second quantization bit number and a second sampling frequency, the second quantization bit number differing from the first quantization bit number, the second sampling frequency differing from the first sampling frequency; and

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third means for formatting the front-channel digital audio

signal, the rear-channel digital audio signal, information of the first and second quantization bit numbers, and information of the first and second sampling frequencies into a structure having first and second areas, the first area containing the front-channel digital  
5 audio signal and the rear-channel digital audio signal, the second area differing from the first area and containing the information of the first and second quantization bit numbers and the information of the first and second sampling frequencies.

10 16. An audio-signal encoding apparatus comprising:

first means for assigning each of first-channel and second-channel analog audio signals to either a first channel group or a second channel group;

second means for quantizing the analog audio signal in the  
15 first channel group into a corresponding digital audio signal in the first channel group at a first sampling frequency and a first quantization bit number;

third means for quantizing the analog audio signal in the second channel group into a corresponding digital audio signal in  
20 the second channel group at a second sampling frequency and a second quantization bit number; and

fourth means for formatting the digital audio signals in the first and second channel groups, information of the first and second quantization bit numbers, information of the first and second  
25 sampling frequencies, and information of the assignment of the first-channel and second-channel analog audio signals to the first

and second channel groups into a structure having first and second areas, the first area containing the digital audio signals of the first and second channel groups, the second area differing from the first area and containing the information of the first and second

5 quantization bit numbers, the information of the first and second sampling frequencies, and the information of the assignment of the first-channel and second-channel analog audio signals to the first and second channel groups.

10 17. An audio-signal decoding apparatus comprising:

first means for extracting information of a first quantization bit number for a front channel and information of a second quantization bit number for a rear channel from a reproduced signal, the second quantization bit number differing from the first quantization bit

15 number;

second means for deriving a front-channel digital audio signal and a rear-channel digital audio signal from the reproduced signal;

third means for decoding the front-channel digital audio signal in response to the information of the first quantization bit

20 number; and

fourth means for decoding the rear-channel digital audio signal in response to the information of the second quantization bit number.

25 18. An audio-signal decoding apparatus comprising:

first means for extracting information of a first sampling



frequency for a front channel and information of a second sampling frequency for a rear channel from a reproduced signal, the second sampling frequency differing from the first sampling frequency;

second means for deriving a front-channel digital audio signal  
5 and a rear-channel digital audio signal from the reproduced signal;

third means for decoding the front-channel digital audio signal in response to the information of the first sampling frequency; and

fourth means for decoding the rear-channel digital audio  
10 signal in response to the information of the second sampling frequency.

19. An audio-signal decoding apparatus comprising:

first means for extracting information of a first quantization bit  
15 number and a first sampling frequency for a front channel and information of a second quantization bit number and a second sampling frequency for a rear channel from a reproduced signal, the second quantization bit number differing from the first quantization bit number, the second sampling frequency differing from the first  
20 sampling frequency;

second means for deriving a front-channel digital audio signal and a rear-channel digital audio signal from the reproduced signal;

third means for decoding the front-channel digital audio signal in response to the information of the first quantization bit  
25 number and the first sampling frequency; and

fourth means for decoding the rear-channel digital audio

signal in response to the information of the second quantization bit number and the second sampling frequency.

20. An audio-signal decoding apparatus comprising:

5 first means for extracting information of a first quantization bit number and a first sampling frequency for a first channel group and information of a second quantization bit number and a second sampling frequency for a second channel group from a reproduced signal, the second quantization bit number differing from the first  
10 quantization bit number, the second sampling frequency differing from the first sampling frequency;

second means for deriving a first-channel digital audio signal and a second-channel digital audio signal from the reproduced signal, each of the derived first-channel and second-channel digital  
15 audio signals being assigned to either the first channel group or the second channel group;

third means for extracting information of the assignment of the first-channel and second-channel digital audio signals to the first and second channel groups from the reproduced signal; and  
20 fourth means for decoding the first-channel digital audio signal and the second-channel digital audio signal in response to the information of the first and second quantization bit numbers, the information of the first and second sampling frequencies, and the information of the assignment of the first-channel and second-  
25 channel digital audio signals to the first and second channel groups.

21. An optical disc player comprising:  
first means for reproducing audio packs and control packs  
from an optical disc;  
first and second buffers;  
5 second means for alternately writing the reproduced audio  
packs into the first and second buffers;  
third means for decoding the reproduced control packs into  
control data;  
fourth means for decoding the audio packs in the first and  
10 second buffers into audio data in response to the control data; and  
a D/A converter for converting the audio data into an analog  
audio signal.
22. An optical disc player as recited in claim 21, wherein each of  
15 the first and second buffers has a capacity of 4 kilobytes.
23. A digital signal recording disc as recited in claim 8, wherein  
the first area stores audio data in an audio packet, and the second  
area stores audio data information ADI in the audio packet.  
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24. A digital signal recording disc as recited in claim 8, wherein  
the first area comprises an audio contents block set ACBS, and the  
second area stores an audio-only-title audio-object attribute AOTT-  
AOB-ATR in audio title set information ATSI.  
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25. An audio-signal encoding apparatus as recited in claim 16,

further comprising:

fifth means for formatting the digital audio signals into audio data in audio packets; and

sixth means for formatting the information of the first and  
5 second sampling frequencies, the information of the first and  
second quantization bit numbers, and the information of the  
assignment of the first-channel and second-channel analog audio  
signals to the first and second channel groups into audio data  
information ADI in the audio packets.

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26. An audio-signal encoding apparatus as recited in claim 16,  
further comprising:

fifth means for formatting the digital audio signals into an  
audio contents block set ACBS; and

sixth means for formatting the information of the first and  
15 second sampling frequencies, the information of the first and  
second quantization bit numbers, and the information of the  
assignment of the first-channel and second-channel analog audio  
signals to the first and second channel groups into an audio-only-  
20 title audio-object attribute AOTT-AOB-ATR in audio title set  
information ATSI.

27. An audio-signal decoding apparatus as recited in claim 20,  
wherein the first means comprises means for reproducing the  
25 information of the first quantization bit number and the first  
sampling frequency, and the information of the second quantization

bit number and the second sampling frequency from audio data information ADI in an audio packet, and wherein the third means comprises means for reproducing the information of the assignment of the first-channel and second-channel digital audio signals to the first and second channel group from the audio data information ADI in the audio packet.

28. An audio-signal decoding apparatus as recited in claim 20, wherein the first means comprises means for reproducing the information of the first quantization bit number and the first sampling frequency, and the information of the second quantization bit number and the second sampling frequency from an audio-only-title audio-object attribute AOTT-AOB-ATR in audio title set information ATSI, and wherein the third means comprises means for reproducing the information of the assignment of the first-channel and second-channel digital audio signals to the first and second channel group from the audio-only-title audio-object attribute AOTT-AOB-ATR in audio title set information ATSI.